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What Comes after Web 3.0? Web 4.0 and the Future

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***Abstract*— The World Wide Web (WWW) as the largest global information media through which user can share, read, and writes data through computers connected with internet.WWW has had much progress since its advent. This paper provides a brief idea of the evolution of the web from web1.0 to web4.0.Web1.0 was about connecting and getting information on the net.Web2.0 was the emergence of social media and user-generated content.Web3.0 is generally regarded as the emergence of the semantic web, where computer will generating and thinking new information rather than humans . Web 4.0 will be the Internet of things or we may name it as a web of intelligence connections.**

Keywords*— *Web1.0, Web2.0, Web3.0, Web 4.0, Security Challenges.

I. INTRODUCTION

The internet and the web is not synonymous both are two separate but related thing. Internet is simply a network of networks where millions of computer are globally connected forming a network in which any computer can communicate with any other computer. World Wide Web is a way of accessing information over the medium of the internet by displaying web pages on a browser, information are connected by hyperlinks ,can contains text, graphics, audio, video.

Web1.0 is the first generation of the web, also known as informational web. User only can read and share information over web pages.

Web2.0 is the read write networking platform, where the user can communicate among each other.

Web3.0 could be define as semantic web, personalization like my yahoo, iGoogle etc. It changes the web into a language that can be read and categorized by the system rather than human.

Web4.0 will be about a linked web which communicates with us like we communicate with each other.Web4.0 [13] is called "Symbiotic" web which is very powerful and fully executing.Web4.0 will be read-write-execution-concurrency web.

II. WEB 1.0 (FROM 1997 TO 2003)

It's the origins of web, invented by Tim Berners-Lee and it represented as read only web where there are small amount of producer create web pages (interlinked) and a large number of customers access those web pages through browser via internet. Here user can only read information, user cannot interact with the content of the pages (like comment, answers etc).Web1.0 doesn't support two-way communications [Fig1], it was purely base on client-pull model (HTTP) that can be initiated by client only.

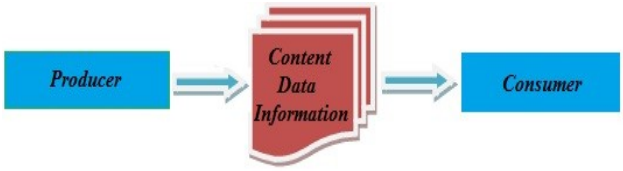

Fig 1: Web1.0 is a one-way platform [3]

Technologies used in Web1.0 are HTML, HTTP, URI these are core web protocols, some newer protocol are also in used like XML, XHTML and CSS. In web1.0 both server side and client side scripting are used such as ASP, PHP, JSP, CGI, PERL as server side scripting and JavaScript, VBscript, flash as client side.

III. WEB 2.0 (FROM 2004 TO 2006)

Web2.0 is known as read-write web [Fig 2]. It is basically a new way to use existing internet technologies. In web2.0 the web user cannot only read the content but also write, modify and update the content online, it supports collaboration and help to gather collective intelligence rather web1.0 [2].

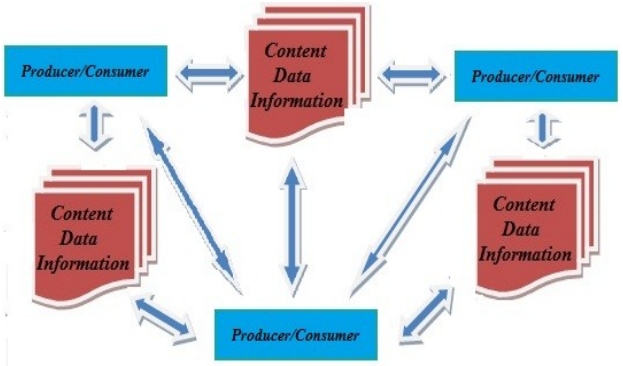

Fig: 2 Web2.0 is a two-way Platform

Web2.0 as the next generation of networking services evolved and transferred the network in to a platform by supporting an new idea to exchanges as well as share the content through applications such as wiki, web blogs,widgets and mashups etc.

A. *Web2.0 Security Challenges*

Today's web2.0 [6] applications are openly accessible and dynamically generated, this feature of web2.0 makes more interesting but it causes bigger security risk.

For example User/Hacker may upload content, which can run code or carry malware to perform some malicious task. Sometimes hacker may upload software like free anti-virus to social sites like facebook (Now a day's peoples are too much addicted to facebook or other social networking sites and user are blindly click each and every link and every application and hacker takes the advantage of this stupidness) or any other web sites that is supposed to be virus removal software but that instead load a Trojan horse. Hackers may upload harmful code that could include key loggers that capture victims' keystrokes- including victims' credit card information, password and send them back to hacker.

IV. WEB 3.0 (FROM 2007 TO 2011)

It is more difficult to answer the question "what is web3.0??", different Internet experts has their different approaches and opinions to the future web. Major IT experts consider web3.0[Fig:4] as a semantic web and personalization.

According to *Conrad Wolfram* web3.0 is where computer will generating and thinking new information rather than humans.

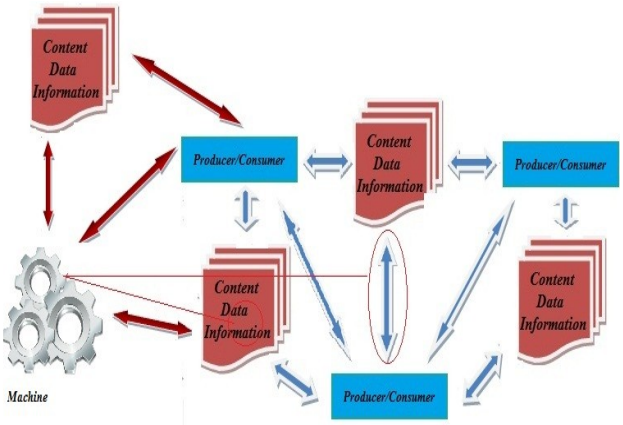

Fig : 4 Web3.0(Semantic Web)

Google CEO, *Eric Schmidt* says web3.o will be "applications which are pieced together – relatively samll,the data are in the cloud and it can be run on any device(pc or mobile),very fast,very customizable and distributed virally(social network,email,etc)"

Yahoo founder, *Jerry Yang* thinks that web3.0 is a collection of tools and techniques for creating programs and online application,which blur the distinction between professional,semi-professional and consumers. Yang stated[8].

"..you don't have to be a computer scientist to create a program. We are seeing that manifest in Web2.0 and 3.0 will be a great extension of that, a true communal medium...the distinction between professinal , semi-professional and consumers will get blured,creating a network effect of business and applications" – Jerry Yang[8].

Nova Spivak from Radar Network believes that web3.0 will be "The Semantic web" which will play a central role in the new generation.

A. *Key Elements of Web 3.0*

Web3.0 is build on the kinds of applications and services that makes it so popular in past few years. Now a days search engines are able to produce much more coplete and targeted information,users are even more tightly connected with friends and businesses via social media applications , greater ability to record and store the information makes web3.0[8][11] more precise and helpful for the web users.In this section we present some of the key elements that might become the building blocks of the next generation of the web.

1) The Social Web: In past several decades social networks has a huge popularity amoung like minded peoples and community groups, they share their feelings,thoughts,ideas using web3.0 technologies instead of linking documents only. Social web are considered as an efficient and attractive way of connecting people around the globe.

2) The Semantic Web: Semantic web is an evolving extension of the web3.0, that allow people to find the information much deeper level the meaning of the search terms and the context in which they are used.The information are structured in such a way that machines can read it and understand it as much as humans can,with out ambiguousness.

3) Web 3D: In past few years virtual 3D world such as Second life[9],Red Light[10] etc have gained huge popularity in public.Web3D allow people to live in a virtual world as an avatar on behalf of him and can explore,meet other residents,participate in individual and/or group activities etc etc as people do in their real life.All the activities occuring between avtars are reside in the virtual world only and there is nothing to do with the real life in real time.

4) The Media Centric Web: According to media centric web approach ,in near future search engines are able to take media such as audio,video,image etc as an input element and be able to search for similar media objects.

For example if we want to search images about cars ,all we need to provide an car image as an input to the search engine and based on the features present in that car image, engine should able to retrieve images of cars with similar features.

B. *Security and Challenges of Web3.0*

In the evolution of the web from web1.0 to web3.0 the various issues related to scalability,security and performance present in web1.0 and web2.0 are also propagate to web3.0 and create a big challenging task for IT expart.Because of the huge collaboration of public and private data make web2.0& web3.0 [12]more interactive and popular among web users and as well as for hackers also.

There is a lack of data standard for controlling over metadata and data privacy.RDF schema(RDFS) and Web Ontology Language(OWL) used URI(Unified Resource Identifiers) to represent data which can be held in database

and/or interchanged without specifying any access policy or trust bounderies.It make web3.0 vulnerable ,attackers may falsify the data intentionally and can create false services.

Data privacy in web3.0 is one of most security issue for the IT professional.Producers and customers are creating new contents,techniques day by day and publish it for the world for anyone.They make deals,share their data and ideas among each others. If someone gives you the full control over his private data(like Online-games,) ,considering you as a trusted and capable of good control of his data.What happen when you betrayed him,you have the full control of his data so you can modify and publish it for the world by mistake or intentionally.Illegal and manipulated forms of the same type of data will be available on the web,which may create multiplications of error for anyone.

V. WEB 4.0(2012-??)

It is a bit early to start talking about web4.0, its still an underground idea in progress. There is no proper definition of it yet. Computer expert suggests some names like artificial intelligence, Webos. Web 4.0 [Fig.4] can also be named as "Symbiotic" web. The idea being the symbiotic web is that once the metadata are organised (Web3.0) human and machine can interact in symbiosis. It will be able to "Think and make decisions" with regard to user searches and content. It will be able to give suggestions based on educated studies of how we live and what we want or need.

Let's say someone wanted to learn how to fix glitch crippling in a new piece of technology that was just recently put on the market .It would be too early for other users to help him to do this, and the developers have not been able to troubleshoot the problem because it never occurred in the testing phase of development. So theoretically the future web technology world allow for a computer to analyze the problem and offer you a solution. In fact, it may be able to fix the problem itself.

Web4.0 offers a new model of user interaction with the most comprehensive and personalized, not limited simply to display information, but proposes to behave like a intelligent mirror that concrete solutions to what the user needs.

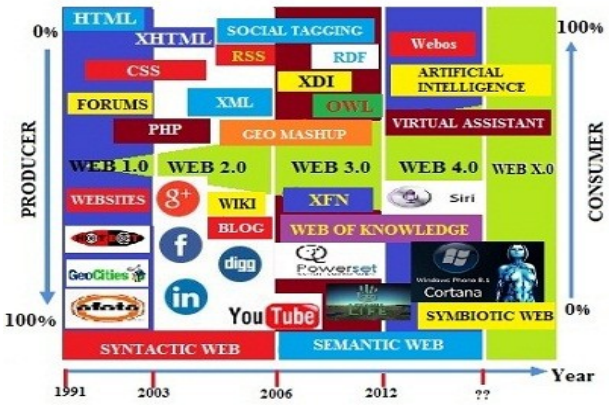

Fig.4. Web Evolution from Web1.0-Web4.0

A. Basic Idea Behind Web4.0

Web 4.0 based on four main concepts [14] such as

1) Natural Language Understanding(NLU) Technique: It's a subtopic of natural language processing in artificial intelligence that deals with machine reading comprehension.

2) New model of machine to machine(M2M) Communication: The network will consist of intelligent agents in the cloud, be able to communicate among them and delegate the response to the right agent.

3) New model of interface: It is based on simple lists of results, but will use new models of interaction or even execute specific actions by computing with the mobile terminal capabilities. For example if we make queries such as "I want a cab to come pick me" and my phone must be capable of to contact nearest Cab Company automatically without direct user intervention.

B. Benefits of Web4.0

The advantages and possibilities open to this new web model [14] can highlight the following.

1) *Accessibility:* The creation of new patterns of Com-munication with the machine will bring the internet to people that complexity does not understand the use of browser and the possibilities that the internet has to offer.

2) Distributed Computer-Based Information Agents: Intelligent agents are elements that process information and communicate with them.

3) Improved User Experience Through Personalized Agents: The agent interacts with the user offering customized content, try to correct the difference between what we find and what they found, performed tasks for the user accessing context information and communicating with other intelligent agents in the network to provide the user information would have to search manually.

4) *More Efficient Exploitation Of The Semantic Web:* The semantic web is an extremely high demand today. The semantic based search engines are tools that are being implemented in many systems. This demand will generate new requirements associated with the integration with users. It will require a new type of communication to facilitate the access and representation of information.

C. What may comes in future Web

The future generation of web will be the next great phase of internet, where not only people (Web 1.0& Web 2.0) or machines (Web3.0) are connected. These objects could literally be anything from a toaster, to a car, our keys, our phone, books etc, the list is endless.

Every object is connected by assigning them an IP address, which provides them with the ability to transfer data over network. When objects are connected they need to store data about themselves and/or their environment. As every connected things will be collecting huge amounts of data on daily basis, it will be nearly impossible to use traditional search methods .As technology expert brain profit puts in "instead of looking for things in the world, those things will be

seeking us out to give us all sorts of information that will help us fix, use or buy them".

In the mean time, there are companies already beginning to do cool things, experimenting with the sort of predictive intelligence that one might expect from a "linked data" web4.0 world. Company like *Hunch.com* in particular attempts to help people to purse through excessive data on the internet, by looking at the user/customer past interests and those of their friends to determine what user/customer might like and limit their choices accordingly. According to company CEO fewer purchase are made when customers are presented with too much information or too many choices. It is thus worthwhile technology for retailer to pursue, in an effort to predictively get fewer precision choices in front of each consumer.

According to tech companies like "Apple", "Google" and "Microsoft" personal assistant will be the future for all of us and we will soon spend our days interacting with our phones, conversing with "Siri", "Google Now" or "Cortana" all day long. After "Siri" and "Google Now", an intelligent personal assistant developed by Apple and Google respectively, In the month of March 2014, Microsoft released a demo version of digital personal assistant for windows phone 8.1.Cortana is currently the code name for a whole new way of controlling windows phone and in the longer term may be windows too. It will respond to our voice, answer each question we asked, control our devices and anticipate the information such as location data, personal information, reminders when we need at particular times.

D. Challenges and Disadvantage of Web4.0

One of the most critical developments of web4.0 [15] will be the migration of online functionality into the physical world. For example, imagine being able to Google our home to locate car keys or the remote control. The another challenges of the future web[16] will have to face are those concerning industry standards such as wireless connections, telecommunication lines doing the actual connection and a language that is understandable by all devices and not only by a few belonging to a certain company.

As nothing safe on the internet. Web4.0 will also be facing privacy, because personalized search is only possible if the user provides the respective search engine with his personal data. If we consider services like *Google Earth* that can provide users with information about other people's whereabouts and the tracking devices in some of the newer cell phones being released. So these kind of information are easily available now a days and no one know where does all that information go, and who gets to see it?

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